PhotriX™ Series

Ultra accurate, precise infrared thermometer with unmatched low temperature capability

MIKRON INFRARED
A LUMASENSE TECHNOLOGIES Company

The PhotriX™ series of infrared thermometers from Mikron offers best-in-class radiation pyrometry in a robust and flexible package designed for ease of integration. The superior performance allows users to have insight into process behavior previously not possible.

Lowest temperature capability short wavelength pyrometer

Five (5) spectral response options:

- 650nm: 400° C up to 2600° C
- 880nm: 220° C up to 2600° C
- 900nm: 210° C up to 2600° C
- 1550nm: 70° C up to 2600° C
- 700-1650nm: 30° C up to 2400° C

Configurable collection optics:

- Lens, Lightpipe, and/or Fiber Optics

Precision Optics:

- Spot size as small as 0.5mm
- Narrow beam width capability

High speed (1ms)

Shorter wavelength = Higher accuracy

When choosing an infrared temperature sensor, one of the most important factors to consider is what wavelength should be used for the measurement. The physics of infrared thermometry govern that the shorter the measurement wavelength, the higher the measurement accuracy. No instrument design can violate this principle. (For further technical background, please read Technical Note TN-830.)

By using both short and narrowband wavelengths, the Photrix Series of pyrometers allows Mikron to push the accuracy of infrared thermometry to the natural limits. The accuracy improvement can be more than an order of magnitude moving from 8-14µm to 0.9µm (900nm) measurement wavelengths. Further, the Photrix Series' unmatched signal-to-noise ratio (SNR) allows the measurement of significantly lower temperatures compared to other commercially available sensors using the same short wavelengths.

Designed for ultimate process control

The PhotriX™ uses short wavelength, narrow bandwidth detectors that minimize the effect of emissivity errors and improve accuracy of the measurements. The PhotriX™ also offers ambient temperature compensation to combat drift for unmatched longterm stability and reproducibility for long process cycle applications like crystal growth and for repeatable results run after run. With the above mentioned 900nm wavelength, the Photrix offers better than 0.01 C resolution at 1ms response time at temperature 550 C and above.

Tailored solution for your application

The Photrix Series offers a wide variety of options and optical designs that allow it to be configured for the best possible measurement in a given application. The optics are of the highest quality. For example, using the highest quality optics, measurement spot sizes smaller than 0.5mm in diameter with excellent rejection of stray light are offered.

Typical Applications

Semiconductor
- RTP
- MBE
- CVD, MOCVD
- PVD
- ALD
- Implantation
- Packaging
- Magnetic media film deposition

Solar (PV) cells
- Thin-film deposition
- Boule growth

Crystal growth

Optical coatings processing

Laser based welding and heating

Aluminum

Microwave processes

Solutions from *The Infrared Pros*

With more than 40 years experience providing temperature measurement solutions for the most demanding and hostile applications, Mikron Infrared specializes in providing the optimal solution for industrial applications. Mikron offers the broadest selection of IR temperature products and accessories. Our highly experienced team of applications engineers provides custom design and integration support to adapt our products to your application. For more information on the PhotriX and other Mikron temperature measurement products, visit our web site at www.mikroninfrared.com.You can learn more about temperature and gas measurement solutions from LumaSense Technologies at www.LumaSenseInc.com.

System Description

A PhotriX system can be used as a single channel measurement device or multiple units can be networked together using a mutli-channel interface module.

Communication options supported:

- Analog: 4-20mA or 0-10V
- Serial: RS-232 or RS-422
- PC based GUI software
- Modbus
- Easy to use with LabView
- Ethernet with optional MCI module

The PhotriX system is composed of the following standard hardware components:

- Collection Optics
- Detector Electronics Module (DEM)
- Communications Interface Module (CIM)
- Power Supply (standard system includes a universal AC/DC power supply, but CIM can be powered directly with 12 VDC)
- Electrical connection cables
- PC software included

Four Collection Optics Options

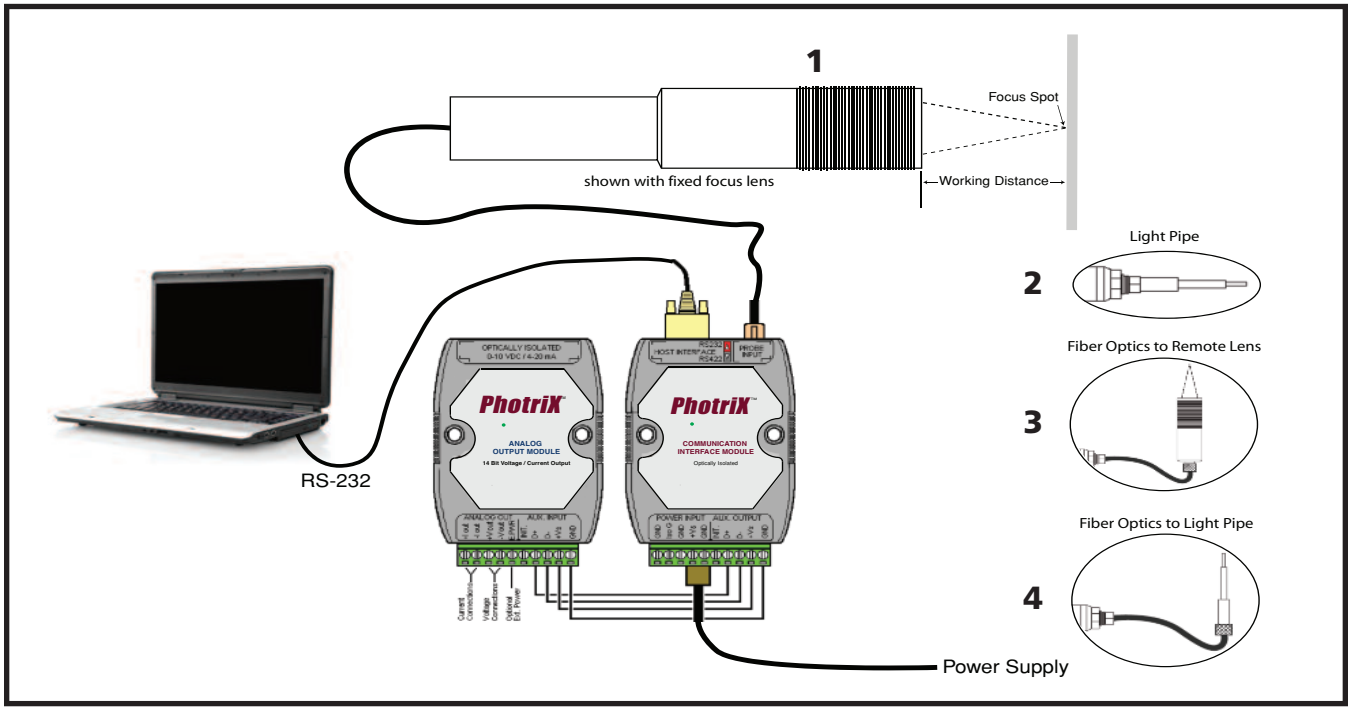
The optics capture the thermal radiation from the measurement target and deliver it to the detector. The PhotriX series collection optics can be configured in four distinct forms to better suit an application's requirements.

1-Lens Optics: For viewing targets through windows or viewports. The working distance and spot size of the Lens is specified at time of order. Spot sizes as small as 0.5mm standard.

2-Lightpipe Optics: The lightpipe is an optical rod constructed of a single-crystal sapphire. These are ideal for insertion into vacuum chambers or to view difficult-to-reach targets. Lightpipes can be factory bent, inserted through small holes or vacuum fittings, and can survive harsh temperature and pressure environments. This is also compatible with most cleaning processes used in semiconductor process chambers.

3-Fiber Optics to Remote Lens: For applications where environment near window is too harsh for electronics, when there is not enough space for electronics, or when concern for explosion requires the electronic components to be located far from the point of measurement.

4-Fiber Optics to Lightpipe: For applications where space around furnace or reactor is either too harsh for electronics (e.g., strong RF field) or if there is simply limited space and therefore the fiber optics allow the electronics to be located remote from the lightpipe.



Wavelength Tailored for Precise Process Control

A PhotriX system is available in five different spectral response ranges. Four of these ranges offer narrow spectral bandpass. Choosing the shortest wavelength possible for an application offers the following benefits:

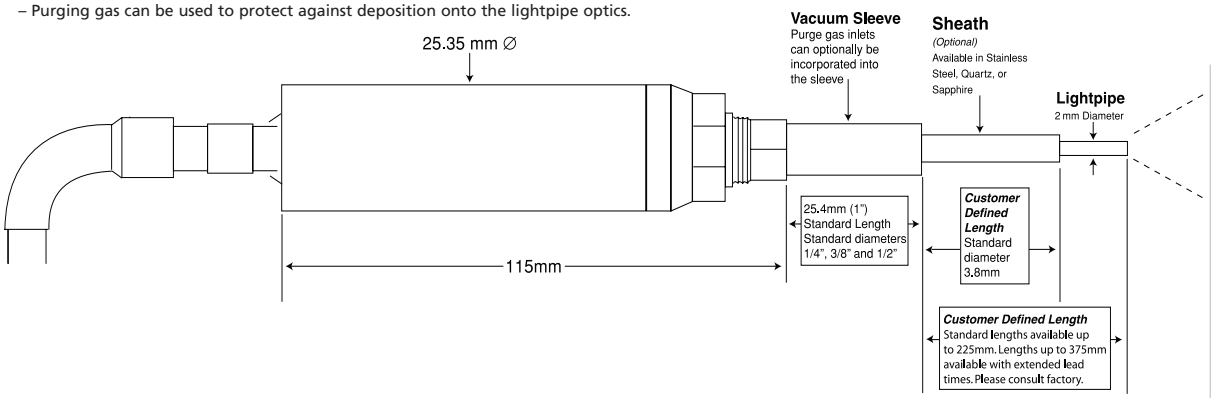
- Better sensitivity
- Smaller measurement errors due to emissivity uncertainty,
- Enables use of fiber optics in collection optics path, and
- Ability to measure Silicon and other semiconductor materials that are transparent at longer wavelengths.

Spectral Sensitivity		Temperature Range				Typical Applications
Code	Response	Celsius		Fahrenheit		
		Min*	Max*	Min*	Max*	
/065	650nm	400° C	2600° C	752° F	4712° F	High Temperature Metals, Solar, SiC
/088	880nm	220° C	2600° C	428° F	4712° F	Compound Semiconductor
/090	900nm	210° C	2600° C	410° F	4712° F	Semiconductor, Silicon
/155	1550nm	70° C	2600° C	158° F	4712° F	Metal and Ceramic Processes Requiring Highest Accuracy/Precision
Standard	700 – 1650nm	30° C	2400° C	86° F	4712° F	Low Temperature Metals, Ceramics, and Metal Oxide Processes

*Temperature range is configured at factory. Higher temperatures can be special ordered up to 4000° C. See Technical Note TN-831 for further details on specific temperature ranges for different product configurations.

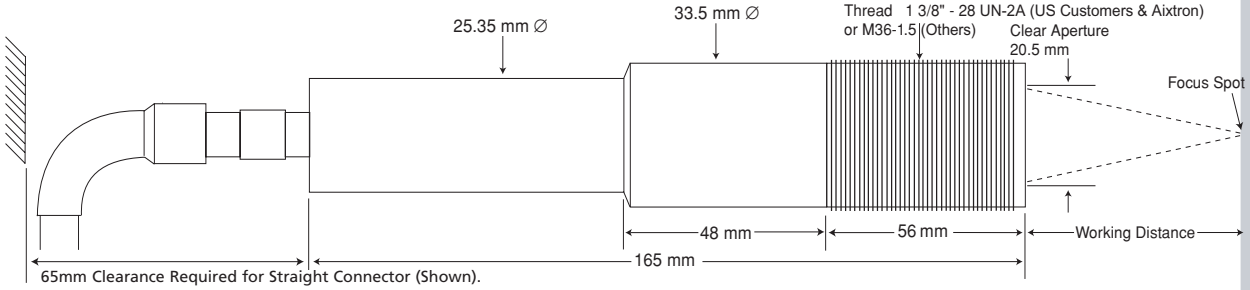
PhotriX Lightpipe Version

– Tip of lightpipe positioned close to target,
– Stainless steel sleeve is used for mounting in vacuum / pressure fittings,
– Sheaths of stainless steel, quartz, or sapphire are optional,
– Purging gas can be used to protect against deposition onto the lightpipe optics.



PhotriX Fixed Focus Lens Version

– Custom spot sizes and working distances available per OEM requirements,
– Sensor mounted using integrated threads on body (English or Metric threads)



Technical Specifications

Collection Optics	Lightpipe					Lens				
Wavelength Response										
Center	650nm	880nm	900nm	1550nm	700-1650nm	650nm	880nm	900nm	1550nm	700-1650nm
FWHM	40nm	60nm	60nm	50nm	N.A.	40nm	60nm	60nm	50nm	N.A.
Temperature Range*										
Celsius (° C)	400-1500	220-1300	210-1300	70-1100	30-670	490-2600	280-2150	270-2150	125-2600	65-1000 135-2400
Fahrenheit (° F)	752-2732	428-2372	410-2372	158-2012	86-1238	914-4712	536-3902	518-3902	257-4712	149-1832 275-4352
Accuracy	± 1.5° C or 0.15% of reading									
Precision	0.01 C, wavelength, speed and temperature dependent. See Technical Note TN-828 for details.									
Response Time	User adjustable up to 1ms									
Drift	<0.15° C per year									
Output	RS-232 (standard), Modbus protocol supported, Analog Output (optional)									
Electronics Ambient	10 – 60° C (50 – 140 ° F)									
Weight	310 grams					500 grams				
Power	110/220 VAC, 50-Hz and 60-Hz (also accepts 10-30 VDC)									

*See Technical Note TN-831 for additional temperature range options. Temperautre range is factory configured and calibrated.

Standard System Includes:

- Detector Electronics Module (DEM)
- Communications Interface Module (CIM)
- Universal switching power supply
- PC software
- 4m electrical cable to connect DEM to CIM
- 3m RS-232 cable to connect CIM to PC
- User's Manual

Measurement Options:

- See Technical Note TN-FS831 for a full listing of available standard temperature range configurations
- Custom cable lengths available for surcharge
- Fiber optic cable connection between collection optics and electronics
- Bent tip lightpipes (see photo below)
- Protection sheaths with optional purge for lightpipes

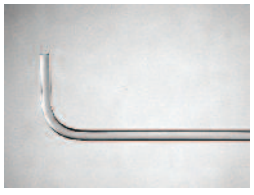
Optional Accessories

Analog output module, supports both 4-20mA and 0-10V

Sapphire or Quartz Sheath to Protect Lightpipe

Multi-channel Interface Module (MCI)

Fiber Optic connection between detector and collection optics (Lens or Lightpipe)



Bent Tip Lightpipe

Right Angle Electrical Cable Connection to DEM (standard cable is straight)

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